Listing and Amendments to the Claims

This listing of claims will replace the claims that were published in the PCT Application and the International Preliminary Report on Patentability:

1. (currently amended) Method for digitally encoding ~~(10...19)~~ a picture sequence, wherein the frames ~~(FRM)~~ of said picture sequence are arranged in macroblocks ~~(MB)~~ containing pixel blocks and the frames are encoded in bi-predictive and predictive and/or intra coding types denoted B, P and I, respectively, and wherein adaptively, for the purpose of overall bit rate control, a specific frame target number of bits is assigned to these coding types, and wherein said overall bit rate control includes a frame-layer rate control and a macroblock-layer rate control which macro-block-layer rate control selects macroblock quantisation parameters, said method ~~being characterised by~~ comprising the steps:
    -   assigning ~~(10)~~ a target number of bits to anchor frames but not assigning a target number of bits to non-anchor frames;
    -   coding the macroblocks of said anchor frames ~~(P, I)~~ using macroblock-layer rate control ~~(10)~~ by adaptive macroblock quantisation ~~(12)~~ parameters, and coding the macroblocks of said non-anchor frames ~~(B)~~ without macroblock-layer rate control ~~(10)~~ by using fixed macroblock quantisation ~~(12)~~ parameters.

2. (currently amended) Apparatus for digitally encoding ~~(10...19)~~ a picture sequence, wherein the frames ~~(FRM)~~ of said picture sequence are arranged in macroblocks ~~(MB)~~ containing pixel blocks and the frames are encoded in bi-predictive and predictive and/or intra coding types denoted B, P and I, respectively, and wherein adaptively, for the purpose of overall bit rate control, a specific frame target number of bits is assigned to these coding types, and wherein said overall bit rate control includes a frame-layer rate control and a macroblock-layer rate control which macro-block-layer rate control selects macroblock quantisation parameters, said apparatus ~~being characterised by~~ comprising:

- means (10) for assigning a target number of bits to anchor frames but not assigning a target number of bits to non-anchor frames;
- means (11—18) for coding the macroblocks of said anchor frames (P, I) using macroblock-layer rate control (10) by adaptive macroblock quantisation (12) parameters, and for coding the macroblocks of said non-anchor frames (B) without macroblock-layer rate control by using fixed macroblock quantisation (12) parameters.

3. (currently amended) Method according to claim 1 or apparatus according to claim 2, wherein the quantisation (12) parameter used for the coding of non-anchor frames in a current group of frames is directly derived (10) from the average quantisation (12) parameter of the previously encoded anchor frame belonging to that group.

4. (currently amended) Method or apparatus according to one of claims 1 to 3 claim 1, wherein for the bit rate control for the anchor and non-anchor frames inside a current one of said groups a weighting factor $f_{Group\text{-}BP}$ or $f_{Group\text{-}I}$ is used, which weighting factors are adaptively controlled during the encoding of said picture sequence and specify the estimated ratios of the number R_{NA} of bits used for encoding a non-anchor frame to the number $R_{A\text{-}BP}$ of bits required for encoding an anchor frame if it is coded as P or B frames, or $R_{A\text{-}I}$ if it is coded as I-frame:

$$f_{Group-BP} = \frac{R_{NA}}{R_{A-BP}}, \quad f_{Group-I} = \frac{R_{NA}}{R_{A-I}} \ .$$

5. (currently amended) Method or apparatus according to claim 4, wherein for initialisation at the beginning of encoding a picture sequence said weighting factors $f_{Group\text{-}BP}$ and $f_{Group\text{-}I}$ are set to:

$$f_{Group-BP} = \frac{1}{2}, \quad f_{Group-I} = \frac{1}{10} \ .$$

6. (currently amended) Method ~~or apparatus~~ according to <u>claim 4</u> ~~claim 4 or 5,~~

wherein based on a number $\hat{R}_{Group-BP}$ or $\hat{R}_{Group-I}$ of target bits for a current one of

said groups, the frame target bit number $\hat{R}_{A-BP}$ or $\hat{R}_{A-I}$ for the anchor frame is:

$$\hat{R}_{A-BP} = \frac{\hat{R}_{Group-BP}}{(1 + N_{NA} \cdot f_{Group-BP})} \quad \text{or} \quad \hat{R}_{A-I} = \frac{\hat{R}_{Group-I}}{(1 + N_{NA} \cdot f_{Group-I})} \quad , \text{respectively,}$$

wherein N_{NA} denotes the number of non-anchor frames inside that current

group, and whereby a corresponding accurate macroblock-layer rate control is

used.

7. (currently amended) Method ~~or apparatus~~ according to ~~one of claims 4 to 6~~ <u>claim</u>

<u>4</u>, wherein the non-anchor frame or frames of a current one of said groups are

encoded using a fixed quantisation step size of $Q_{NA} \approx 1.2 \cdot \overline{Q_A}$, where $\overline{Q_A}$ denotes

the average quantisation step size that was used for encoding the anchor frame of

that group.

8. (currently amended) Method ~~or apparatus~~ according to ~~one of claims 4 to 7~~ <u>claim</u>

<u>4</u> wherein, after a current one of said groups has been encoded completely, said

weighting factors $f_{Group-BP}$ and $f_{Group-I}$ are updated in that weighting factors

for said current group are determined by

$$\tilde{f}_{Group-BP}(n_{Group-BP}) = \frac{1}{N_{NA} \cdot R_{A-BP}} \cdot \sum_{k=1}^{N_{NA}} R_{NA}(k) \quad \text{or}$$

$$\tilde{f}_{Group-I}(n_{Group-I}) = \frac{1}{N_{NA} \cdot R_{A-I}} \cdot \sum_{k=1}^{N_{NA}} R_{NA}(k) \quad , \text{respectively,}$$

wherein $R_{NA}(k)$ is the number of used bits for the k-th non-anchor frame inside

said current group, R_{A-BP} and R_{A-I} are the number of bits used for encoding the

anchor frames as P/B-frame or as I-frame, respectively, and $n_{Group-BP}$ and $n_{Group-I}$

are continuously increasing indices for said weighting factors,

and wherein the weighting factors to be used for following groups are each

calculated as corresponding average values of the weighting factors used for

several, e.g. five, of the last encoded groups.

9. (currently amended) Method ~~or apparatus~~ according to claim 4 wherein, if Intra frames are coded rarely, both said weighting factors $f_{Group-BP}$ and $f_{Group-I}$ are updated at the same time by using an adaptively controlled weighting factor $f_{BP-I} = R_{A-BP}/R_{A-I}$, which specifies the estimated bit-rate ratio of anchor frames coded as P/B-frames and anchor frames coded as I-frames, such that

$$f_{Group-I} = \frac{f_{Group-BP}}{f_{BP-I}} \quad .$$

10 (currently amended) Method for digitally decoding an encoded picture sequence, wherein the frames ~~(FRM)~~ of said picture sequence are arranged in macroblocks ~~(MB)~~ containing pixel blocks and the frames were encoded in bi-predictive and predictive and/or intra coding types denoted B, P and I, respectively, and wherein adaptively, for the purpose of overall bit rate control, a specific frame target number of bits was assigned to these coding types, and wherein said overall bit rate control included a frame-layer rate control and a macroblock-layer rate control which macro-block-layer rate control had selected macroblock quantisation parameters,

wherein a target number of bits was assigned to anchor frames but was not assigned to to non-anchor frames,

and wherein the macroblocks of said anchor frames ~~(P, I)~~ were coded using macroblock-layer rate control ~~(10)~~ by adaptive macroblock quantisation ~~(12)~~ parameters, and the macroblocks of said non-anchor frames ~~(B)~~ were coded without macroblock-layer rate control ~~(10)~~ by using fixed macroblock quantisation ~~(12)~~ parameters, said method including the step of:

-   decoding said anchor frames ~~(P, I)~~ using correspondingly adaptive macroblock quantisation parameters, and decoding said non-anchor frames ~~(B)~~ using only fixed macroblock quantisation parameters.